A Guide to the
Power Macintosh

It does more.
It costs less.
It's that simple.

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Introduction

The Foundation for the Future of Personal Computing

Apple hails the next generation of personal computers with the introduction of the *Power Macintosh* computers. Based on the new PowerPC 601 RISC microprocessor, these computers provide unprecedented processing power: Applications designed to take advantage of the PowerPC™ chip run two to four times faster on Power Macintosh computers than on other Macintosh models.

Power Macintosh computers are also the most compatible personal computers on the market. They use the System 7 operating system, so they integrate seamlessly with other Macintosh computers on a network. You can run existing Macintosh applications on your Power Macintosh.

With *SoftWindows* software from Insignia, you can run DOS and Windows applications on it as well. And many Macintosh models sold today can be upgraded to take advantage of PowerPC technology.

There are three PowerPC Macintosh models to choose from. Each has a built-in math coprocessor, NuBus expansion slots, Ethernet networking and 16-bit, CD-quality sound input and output. They each have a port for the Apple Geoport™ Telecom Adaptor, so you can send and receive faxes or connect to electronic information services. Each model is available in configurations that support all the Apple AV Technologies.

What is PowerPC?

Apple's reputation for technological innovation continues with our co-development - along with IBM and Motorola - of the heralded PowerPC microprocessor architecture. By developing this new standard - and by integrating PowerPC with the ease of use of System 7 operating system and communicating advances such as Apple AV Technologies - we've created the Power Macintosh™ computers, a new generation of Macintosh computers.

The foundation of PowerPC - and the future of personal computing - is RISC (Reduced Instruction Set Computing) technology. Until now, personal computers have used the CISC (Complex Instruction Set Computing) microprocessor architecture, while RISC-based processors have been used for higher-performance systems such as servers and workstations.

Apple is the first company to ship personal computers that use RISC-based microprocessors. With the introduction of the Power Macintosh line, Apple offers the only personal computers that integrate the fast PowerPC processor with a mainstream personal computer operating system. This combination has prompted the development of hundreds of new software applications that take advantage of the speed and power of PowerPC technology. And since most current Macintosh models can be upgraded to use the PowerPC processor, you'll be able to use this software on your Macintosh.

The RISC Advantage

Why RISC?

RISC processors streamline the internal workings of computers. Whereas traditional CISC processors contain a wide variety of instructions to handle many different tasks, RISC processors contain only those instructions that are used most often. When a complex instruction is needed, a RISC processor builds it from a combination of basic instructions.

RISC processors are designed to execute these basic instructions extremely quickly. The performance gains achieved by speeding up the most-used instructions more than compensate for the time spent creating less-used instructions.

To date, RISC technology has been used only in systems designed for raw computational power. For example, most engineering workstations and commercial database servers use RISC processors. These computers have generally been based on the UNIX® operating system and have therefore been more difficult to install, learn, use and maintain than personal computer users have come to expect.

Apple believes that now is the time to bring RISC technology to personal computing. One important reason is that the performance improvement of successive CISC processors is levelling off, whereas RISC performance is continuing to grow (see Figure 1). At the same time, RISC will be manufactured in high enough volumes to make it cost-effective for the personal computer market.

Figure 1. CISC vs. RISC Performance Evolution
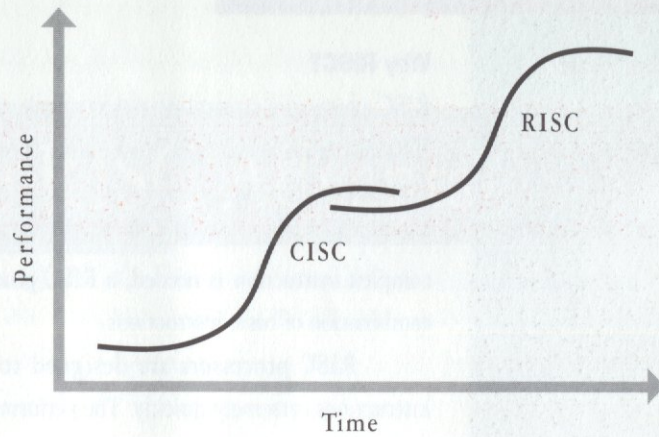
Apple is the only personal computer vendor publicly committed to moving its entire product line to RISC technology. This strategy will eventually bring the benefits of RISC to all Apple customers, whether they are buying entry-level, high-end or notebook systems.

PowerPC

Why PowerPC?

When Apple began to look for the microprocessor that could take Macintosh systems into the next decade, we established a number of criteria. After reviewing most of the leading CISC and RISC architectures in the industry, Apple chose PowerPC.

The PowerPC processor project brings:

- **A mainstream standard backed by major vendors.** With the adoption and anticipated sales of Apple, IBM, Motorola and others, PowerPC processors should quickly become the largest-volume RISC processors in the world and a serious alternative to the Intel 80x86 standard.
- **A scalable architecture that can be used in all Macintosh systems.** Until now, RISC microprocessors have been optimised for high-end workstations and server systems. IBM's willingness to redefine its POWER RISC architecture to create PowerPC processors has resulted in the first mainstream RISC microprocessor that can be used in low-cost computers. Several versions of PowerPC processors are already being developed to meet the needs of different types of personal computer users. This will give Apple a RISC-based growth path for all Macintosh product lines well into the future.
- **Industry-leading technology.** The involvement of IBM and Motorola brings state-of-the-art expertise in both microprocessor design and manufacturing to the PowerPC processor effort.
- **Parallel designs.** Apple, IBM and Motorola have combined their considerable resources to develop several versions of the PowerPC architecture simultaneously. This will allow the alliance to bring PowerPC technology rapidly to all segments of the personal computing market. Different PowerPC processors are being designed for the performance, cost and power-consumption requirements of everything from notebook computers to high-end workstations.
- **Proven high-volume production.** RISC processors today are principally used by lower-volume workstation vendors. Motorola and IBM have proven their ability to manufacture the millions of microprocessors needed for the personal computer market.
- **Superior development tools.** Any new microprocessor architecture needs excellent compilers, debuggers and other development tools to be successful. Because PowerPC processors are derived from the POWER architecture already used in IBM's RS/6000 workstations, many compatible development products already exist and are being optimised for PowerPC. Others are being created expressly for the PowerPC processor–based Macintosh platform.

In short, the alliance of Apple, IBM and Motorola is producing not just a new RISC architecture, but a new level of performance for personal computers.
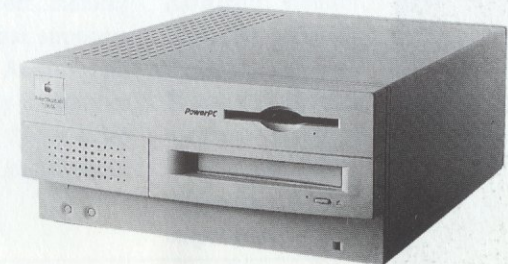
Apple Power Macintosh

Power Macintosh 6100/60

The Apple Power Macintosh 6100/60 is the most affordable Power Macintosh computer. With its PowerPC 601 processor running at 60 megahertz, it's ideal for handling everyday business tasks with exceptional speed. It has an expansion slot that can accept processor-direct cards or 7-inch NuBus cards, so you can add capabilities to your system. The Power Macintosh 6100/60 features built-in support for most Apple displays and supports up to 32,768 colours on the Macintosh Colour Display or the Apple AudioVision 14 Display.
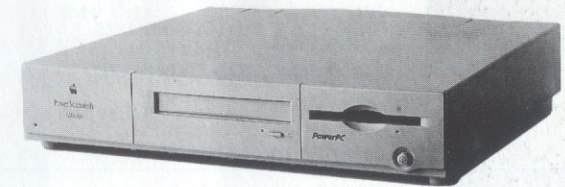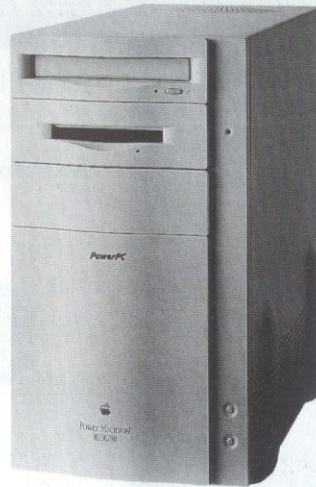
Power Macintosh 7100/66

With its 66-megahertz PowerPC 601 chip, the Apple Power Macintosh 7100/66 is ideal for business users who value a highly responsive computer for their complex spreadsheets, page layout projects or databases. It has three NuBus slots, so you can customise your system to suit your needs. You can connect two displays to the Power Macintosh 7100/66. It supports 32,768 colours on the Apple Multiple Scan 17 Display, and can be used with VGA and SVGA displays.

Power Macintosh 8100/80

The incredibly fast Apple Power Macintosh 8100/80 computer is built to handle the work of advanced users, including professional publishing, computer-aided design or scientific modelling. Its PowerPC 601 processor runs at an impressive 80 megahertz. Dual-monitor support allows you to connect two displays to increase your work space. Features such as an on-chip cache, expansion slots, dual-channel SCSI, high storage capacity, 24-bit colour capability, and extensive memory expansion ensure that this computer can keep up with your needs for years to come.

Power Macintosh	6100/60	7100/66	8100/80
Processor	60 MHz PowerPC 601 RISC processor with integrated math coprocessor and 32K on-chip cache	66 MHz PowerPC 601 RISC processor with integrated math coprocessor and 32K on-chip cache	80 MHz PowerPC 601 RISC processor with integrated math coprocessor and 32K on-chip cache, and 256K memory cache
Memory	8MB of RAM, expandable to 72MB	8MB of RAM, expandable to 136MB	16MB of RAM, expandable to 264MB
Storage	Apple SuperDrive, 160MB or 250MB internal hard disk, space for a 5.25-inch half-height internal storage device	Apple SuperDrive, 160MB or 250MB internal hard disk, space for a 5.25-inch half-height internal storage device	Apple SuperDrive, 160MB or 250MB internal hard disk, space for a 5.25-inch half-height internal storage device and two 3.5-inch internal storage devices
Networking	Built-in LocalTalk and Ethernet connections, AppleTalk networking software	Built-in LocalTalk and Ethernet connections, AppleTalk networking software	Built-in LocalTalk and Ethernet connections, AppleTalk networking software
Expansion	Expansion slot for 7-inch NuBus card or processor direct card (requires adaptor)	Three NuBus expansion slots	Three NuBus expansion slots
Ports	Two serial ports (Geoport compatible), high-performance SCSI port, ADB port, monitor port that supports Apple AudioVision Display or another display, 16-bit stereo sound-input/output ports	Two serial ports (Geoport compatible), high-performance SCSI port, ADB port, monitor port that supports Apple AudioVision Display or another display, standard monitor port, 16-bit stereo sound-input/output ports	Two serial ports (Geoport compatible), high-performance SCSI port, ADB port, monitor port that supports Apple AudioVision Display or another display, standard monitor port, 16-bit stereo sound-input/output ports

Upgrading To Power Macintosh

Power Macintosh Upgrade Chart

Macintosh Model	Logic Board Upgrade			PDS Card
	6100/60 6100/60AV	7100/66AV	8100/80AV	
Quadra 900, Quadra 950				√
Quadra 840AV		√		
Quadra 800		√		√
Quadra 700				√
Quadra 660AV	√			
Centris 650, Quadra 650		√		√
Centris 610	√			√
IIvi, IIvx		√		

Questions & Answers

Q: Why should any customer want a PowerPC-based computer?

A: PowerPC offers substantial price/performance gains over the 680x0 and x86 series of microprocessors. This performance gain lends itself to the emergence of new and exciting technologies, including speech recognition, telephony, video and a multitude of other powerful capabilities. Further extending the power and performance of the Macintosh platform will enable customers to increase their productivity using today's computing solutions as well as making brand new solutions possible—at an affordable price. Additionally, Apple's first products based on PowerPC are the beginning of a new family of RISC-based products. While the Intel world is stretching an old architecture, PowerPC is the start of a new technology curve.

Q: Will a PowerPC Macintosh "look" different from a Macintosh today?

A: The primary operating system for the PowerPC Macintosh is System 7—the same operating system shipping with every Macintosh today. Unlike other vendors who require users to switch to a new operating system to benefit from RISC technology, Apple is moving our mainstream operating system to PowerPC technology. Users get the power of RISC technology, the familiar Macintosh user interface and need no re-training.

Q: Apple will be selling both 680x0-based and PowerPC-based Macintosh systems. How will a customer know which to buy?

A: As they have in the past, customers will make their purchase decisions with certain criteria in mind: features, price, performance, etc. New to their decision process, though, will be the features and capabilities enabled by the performance breakthrough of PowerPC. As usual, there will be a "ladder" of choices built on price versus performance, including both 680x0-based and PowerPC-based systems. Customers will choose where their needs fit into that ladder. Just as Apple sold millions of 68030 products in 1993 even though 68040 products were available, we expect to sell millions of 68040 products in 1994 as PowerPC moves into our mid-range and high-end.

Q: As a Windows user, why should I even care about Apple's PowerPC machines?

A: PowerPC offers a price/performance breakthrough that exceeds the x86 architecture that Windows users run today. By migrating to PowerPC, DOS/Windows users step onto this stronger growth path while maintaining software flexibility. Insignia Solutions is working on a native version of SoftPC, which they call SoftWindows.

Q: What is special about System Software on PowerPC from Apple?

A: Apple is the only company bringing a mainstream personal computer operating system (System 7) to a RISC platform. All other RISC vendors require the user to move to a larger, more complex and sometimes unproven operating system, such as OS/2, UNIX or Microsoft NT.

Q: Which operating system will a PowerPC Mac run? System 8? PowerOpen?

A: PowerPC-based Macintosh systems, like 680x0-based systems, will ship with the standard Macintosh Operating System, System 7.

Q: Will the OS (System 7) print drivers be compatible with current products?

A: Nearly all drivers (including print drivers), INITs, and CDEVs, and other utility software will work on PowerPC-based Macintosh systems.

Q: Is there a true multitasking, protected memory operating system on a PowerPC Macintosh?

A: The operating system shipping on the first generation of PowerPC-based Macintosh systems will be the same System 7 available today. While this includes cooperative multitasking, it does not offer protected memory or pre-emption. Future versions of system software from Apple will incorporate pre-emptive multitasking and protected memory.

Q: Why would someone run PowerOpen instead of Mac OS on PowerPC?

A: Primarily, the benefit of PowerOpen is access to the UNIX operating system. Apple will offer PowerOpen in early 1995 as a server option.

Q: What about DOS/Windows?

A: PowerPC gives us a greatly improved story for DOS/Windows users. Insignia Solutions is working on a native version of SoftPC, which they call SoftWindows. The 601 is a far better platform for their emulator than today's 68040. Consequently a DOS or Windows program can run at speeds comparable to a 486. With this technology, Macintosh with PowerPC offers a migration path for the two operating systems that really matter in the large marketplace today — Macintosh and DOS/Windows.

Q: Will my existing peripherals work (CD-ROM, hard drives, scanners, printers)?

A: NuBus cards (such as networking and video cards), AppleTalk devices (such as printers), SCSI devices (such as hard disks, scanners, and CD ROMs), ADB devices (such as mice, trackballs and keyboards), and other Macintosh cards and peripherals are compatible with PowerPC. If a hardware device works with the new Macintosh AV systems, the odds are excellent that it will work on PowerPC with no problems.

Q: Will PowerPC-based and 680x0-based systems co-exist on the same network or environment?

A: Yes. You will be able to mix RISC-based and 680x0-based Macintosh systems on the same networks, exchange files and disks between them, and enjoy all the other benefits expected from a Macintosh.

Q: What sort of upgrade solutions will Apple have available at introduction, and how much will those upgrades cost?

A: Last year, Apple announced its intention to offer upgrades to PowerPC technology for the following Macintosh models: IIvx, IIvi, Performa 600, Centris 610, 650, 660AV, Quadra 610, 650, 800, and 840AV. The Apple Workgroup Servers 60, 80, and 95 can also be upgraded. In January 1994, Apple also announced the development of a PowerPC upgrade card that creates an upgrade path for the Quadra 700, 900 and 950. Apple also plans to provide upgrades for the current all-in-one personal computers including the LC 520, 550, 575 as well as the Performa 550. In addition, Apple plans to make future PowerPC upgrades available for LC 475, Quadra 605, and Performa 475/76 product lines.

Apple has also stated that upgrades will be available at introduction and that their prices will be affordable. Additionally, Apple and third-party developers are working to create upgrades for other Macintosh models as well. Details on upgrade options will be made available when specific PowerPC-based Macintosh products are announced.

Q: How compatible are today's applications with the PowerPC Macintosh?

A: Today's Macintosh applications should run, without modification, on PowerPC-based Macintosh models. Apple expects their performance to be surprisingly responsive. Of course, performance will vary dramatically based on the application and other factors. In actual use, performance will range from a fast 68030- to a 68040-based Macintosh. Apple has been testing third-party software at developer conferences throughout the world, as well as in our own labs. After testing over a thousand packages, we are confident that compatibility will be excellent.

Q: What won't run on PowerPC?

A: Applications that do not run on current Macintosh systems. In other words, those that have not followed the currently available Macintosh programming guidelines will consequently not run on PowerPC-based Macintosh models. In our testing to date, compatibility looks very good.

Q: What determines whether or not an application will work on a PowerPC Macintosh?

A: If an application is currently written following available Macintosh programming guidelines, it should run without modification on PowerPC through the 68LC040 emulation. (The "LC" stands for the low cost '040. These chips do not have floating point units. An existing application that requires a floating point unit will have to be re-compiled for PowerPC. However, the speed increase for floating point is so phenomenal that these developers are the most excited about the change.)

Q: Which applications will be ready at release and when will a substantial number of native applications be available?

A: Nearly all current Macintosh applications will be compatible at the release of the first PowerPC-based Macintosh models. Many developers are currently porting their products to the PowerPC platform, so there should be a large number of native applications in a very short time. In fact, in the January 1994 issue of MacWorld, over 60 vendors have announced their support for Macintosh with PowerPC. For an extended period, users should expect to see many applications offered in both a 680x0 version and a PowerPC native version.

Q: Which third-party applications are already running in native mode?

A: Although there is no definitive list of native applications, a large number of software developers, including Adobe Systems, Inc., ACI US Inc., Aldus Corporation, Claris Corporation, Deneba Software, Frame Technology, Insignia Solutions, Inc., Microsoft Corporation, Quark Inc., Specular International, and WordPerfect Corporation have announced their intentions to offer new, native versions of their software packages. Thirty-seven more developers announced support in January 1994. In addition, Apple is working with hundreds of other developers worldwide to ensure that all kinds of existing Macintosh applications will be revised to take advantage of PowerPC processor performance.

Q: Will Apple be publishing a list of PowerPC-compatible Macintosh software?

A: Nearly all software that currently runs on 680x0-based Macintosh models will run on PowerPC. A list of exceptions is more likely than a list of compatibles, since most applications will be running at introduction.

Directory of Native Applications

Application	Company
ANIMATION/3D RENDERING	
Electric Image Animation System	Electric Image, Inc.
form•Z	Specular International
Infini-D	auto•des•sys, Inc.
StudioPro	Strata, Inc.
Virtus VR	Virtus Corp.
Virtus WalkThrough	Virtus Corp.
Virtus WalkThrough Pro	Virtus Corp.
ZOOM	Graphisoft U.S., Inc.
COMPUTER-AIDED DESIGN	
ArchiCAD	GraphiSoft U.S., Inc.
ITEDO IsoDraw	ITEDO Software GmbH
MiniCad	Graphsoft
DATABASE	
4D Server	ACI US, Inc.
Microsoft FoxPro	Microsoft Corp.
DESIGN/ILLUSTRATION	
Adobe® Dimensions	Adobe Systems, Inc.
Adobe Illustrator	Adobe Systems, Inc.
Aldus Freehand	Aldus Corp.
Alias Sketch!	Alias Research, Inc.
Fractal Design Painter	Fractal Design Corp.
Kai's Power Tools	HSC Software Corp.
Ray Dream Designer	Ray Dream, Inc.

DOS/WINDOWS COMPATIBILITY

SoftWindows — Insignia Solutions, Inc.

ENTERTAINMENT

Harrier Assault — Domark Software, Inc.

ROUTE 66 — ROUTE 66 Geographic Information Systems B.V.

Spaceway 2000 — Cassady & Greene, Inc.

MULTIMEDIA

Adobe Premiere — Adobe Systems, Inc.

Cumulus — Canto Software, Inc.

ImageBase Pro — ORKIS

ImageBox — ORKIS

VideoFusion — VideoFusion, Inc.

NETWORKING

LANsurveyor — Neon Software, Inc.

MacVisa — Hi Resolution, Inc.

NetMinder Ethernet — Neon Software, Inc.

TCP/Connect II — InterCon Systems

VICOM MultiTerm Blue — VICOM Technology, Ltd.

VICOM MultiTerm Plus — VICOM Technology, Ltd.

VICOM MultiTerm TCP — VICOM Technology, Ltd.

VICOM MultiTerm VT — VICOM Technology, Ltd.

VICOM Pro — VICOM Technology, Ltd.

VICOM RunTime — VICOM Technology, Ltd.

OFFICE PRODUCTIVITY

cc:Mail — Lotus Development Corp.

ClarisWorks — Claris Corp.

Great Plains Dynamics — Great Plains Software

Microsoft Office — Microsoft Corp.

Microsoft Word — Microsoft Corp.

Nisus Writer — Nisus Software, Inc.

PowerSecretary — Articulate Systems, Inc.

WordPerfect — WordPerfect Corp.

PROFESSIONAL PUBLISHING

Aldus Pagemaker — Aldus Corp.

ArtPro — Artwork Systems N. V.

FrameMaker — Frame Technology Corp.

SPREADSHEETS/CHARTING/PRESENTATIONS

Deltagraph Pro 3 — DeltaPoint, Inc.

Microsoft Excel — Microsoft Corp.

Microsoft PowerPoint — Microsoft Corp.

Voyant — Brossco Systems

TECHNICAL ANALYSIS

HiQ — National Instruments Corp.

Mathematica — Wolfram Research, Inc.

MultiFrame 3D — Graphic Magic, Inc.

Ultimage — Graftek

UTILITIES

Cirrus — Canto Software, Inc.

Retrospect — Dantz Development Corp.

Retrospect Remote — Dantz Development Corp.

Radius RocketShare — Radius, Inc.

Dealer's Stamp: